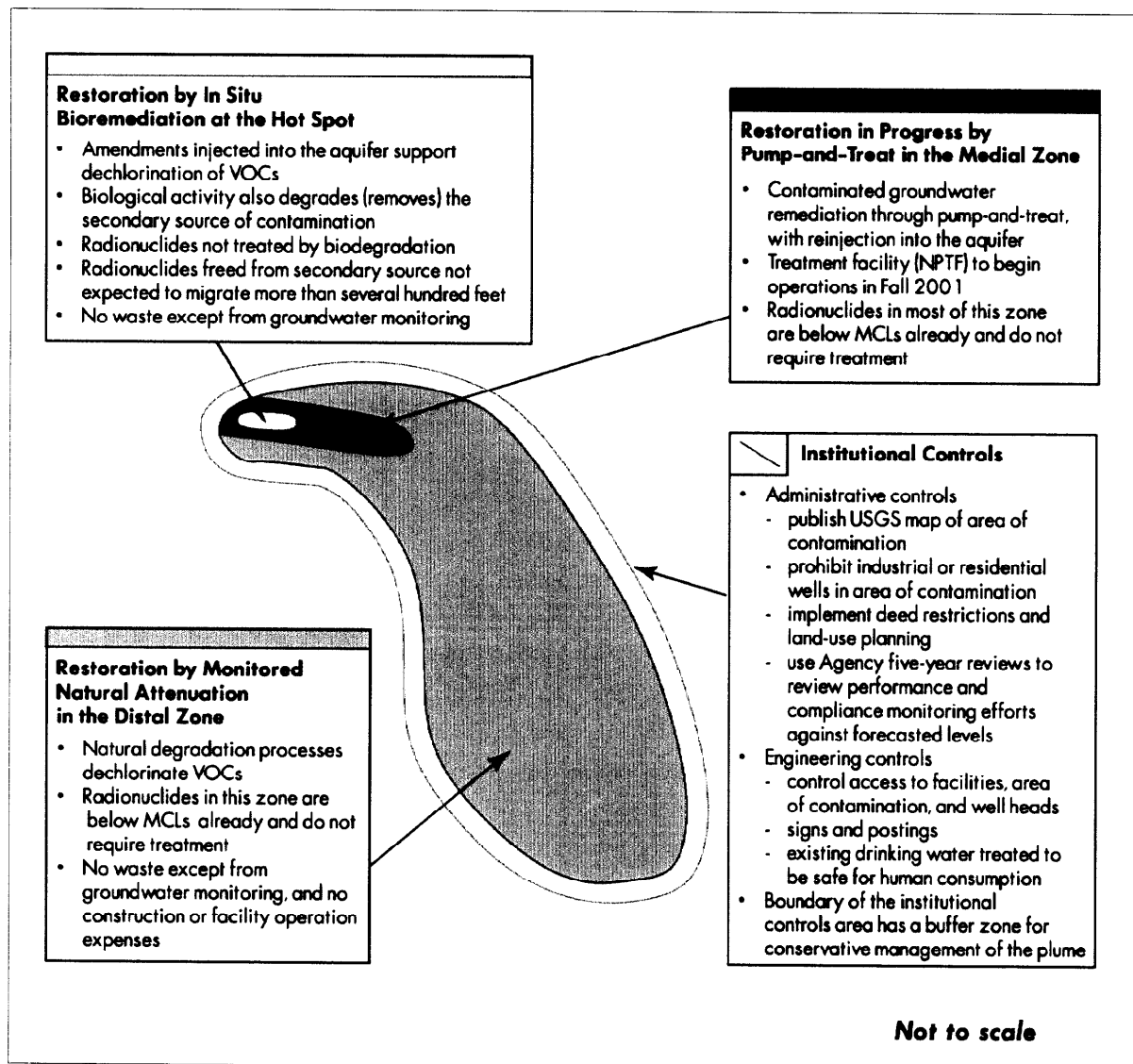


## 8. AMENDED REMEDY

The amended remedy for OU 1-07B combines ISB for hot spot restoration and MNA for distal zone restoration with the pump-and-treat technology (selected in the 1995 ROD) for the medial zone, providing a comprehensive approach to the restoration of the contaminant plume. The amended remedy also includes groundwater monitoring and institutional controls. The decision to implement the amended remedy signifies completion of Phase B of the original remedy and the initiation of Phase C. However, measures implemented during Phase B for hot spot containment will continue until the ISB component of the amended remedy is fully operational.

In accordance with the original remedy selected in the 1995 ROD, construction of the New Pump-and-Treat Facility (NPTF) in the medial zone was completed in January 2001. The facility is scheduled to start routine operations in Fall 2001. Implementation of ISB and MNA will begin when this ROD Amendment is signed. Figure 8-1 is a conceptual illustration of the components of the amended remedy. The components of the amended remedy for restoration of the OU 1-07B hot spot and dissolved phase contaminant plume are:

- Hot Spot – In Situ Bioremediation using amendment injection to create enhanced dechlorination of TCE through anaerobic reductive dechlorination.
- Medial Zone – Pump and Treat with extraction of contaminated groundwater, air stripper treatment, and reinjection of treated groundwater.
- Distal Zone – Monitored Natural Attenuation with annual performance reviews every year for the first 5 years followed by additional reviews at least every 5 years thereafter.
- Institutional Controls – Institutional controls consisting of engineering and administrative controls to protect current and future users from health risks associated with groundwater contamination. The institutional control area will incorporate the anticipated expansion of the distal zone plume and will add controls incrementally based on groundwater monitoring results.
- Monitoring – Groundwater monitoring will be conducted through the plume and samples analyzed to determine the progress of the remedy. Water level measurements will be completed to verify the ability of the NPTF to establish the capture of the contaminants in the medial zone.
- Contingencies – Contingencies identified under this amended remedy are:
  - For the medial zone, monitoring wells located upgradient of the NPTF will be monitored on a routine basis to ensure that concentrations of radionuclides in the groundwater remain low. If monitoring indicates that the concentration of radionuclides in the NPTF effluent would exceed MCLs, the ASTU will be used to prevent those radionuclides from traveling downgradient to the NPTF.
  - For the distal zone, if the Agencies determine that MNA will not restore the distal zone of the plume within the restoration timeframe or if the required monitoring necessary for MNA is not performed, pump-and-treat units will be constructed and operated in the distal zone to remediate the plume.



**Figure 8-1.** Conceptual illustration of the components of the amended remedy (not to scale).

Groundwater monitoring will be the mechanism for collecting performance data to demonstrate (1) TCE flux from the hot spot is below MCLs; (2) radionuclide MCLs are not exceeded at the NPTF; (3) hydraulic capture of the medial zone; and (4) TCE concentrations in the distal zone decline in accordance with modeling expectations. To evaluate attainment of RAOs, groundwater monitoring of the hot spot and contaminant plume will monitor and track the plume boundary, changes in COC concentration levels, and the attenuation rate.

Under the amended remedy, the concentrations of the radionuclide COCs in the hot spot and medial zone will meet RAOs within the remedial timeframe. Concentrations of the radionuclide COCs in the distal zone are already below RAOs. The groundwater monitoring program will include monitoring the attenuation of radionuclide COCs in the hot spot, the medial zone, and the distal zone, as applicable. If monitoring indicates that the concentration of radionuclides in NPTF effluent exceeds MCLs, then the

contingency would be implemented. The frequency of monitoring at selected locations depends on the potential risk of exceeding MCLs in the NPTF effluent. The Agencies will use the monitoring results to determine appropriate responses.

## **8.1 Description of Amended Remedy**

### **8.1.1 In Situ Bioremediation of the Hot Spot**

The amended remedy will utilize ISB for restoration of the hot spot. To implement ISB, the treatment system will inject amendments, such as sodium lactate, through one or more wells into the hot spot. The amendments will act as an electron donor in anaerobic reductive dechlorination, a multistage process that dechlorinates chloroethenes into the harmless compounds carbon dioxide, water, chloride, ethene, and ethane. ISB is a biochemical process carried out by bacteria that are naturally present in the groundwater at TAN. As described in Section 4.2, ISB will be effective both for degrading the chloroethenes dissolved in groundwater and for accelerating degradation of the chloroethenes in the secondary source at the injection well.

Amendments will be distributed as needed. Monitoring will evaluate the progress of ISB and ensure that required levels of amendments are maintained. Amendments will be distributed on a schedule to be determined during post-ROD Amendment activities. The 1999 field evaluation of ISB showed sodium lactate performed well as an amendment; the amendment or amendments that will be used during remediation will be selected in the remedial design/remedial action process. ISB at the hot spot will destroy the VOCs rather than simply transferring them to air, as in pump and treat; worker exposure to contaminants will be minimized. ISB will not treat the radionuclides in this zone.

The amendments added in support of ISB may contain trace constituents that exceed MCLs. However, the Agencies have agreed that amendments containing constituents above MCLs may be injected to support aquifer remediation, if it can be demonstrated that any contaminants in these amendments would not adversely affect meeting the RAOs for this action within the restoration timeframe. The Agencies do not intend to reinject radionuclides above MCLs.

### **8.1.2 Monitored Natural Attenuation of the Distal Zone**

MNA will be used to restore the distal zone. Current estimates indicate that natural attenuation will reduce VOC concentrations to MCLs by 2095. The predictive models used for this estimate are described in the FDR (DOE-ID 2000a [DOE/ID-10718]). Radionuclide concentrations in the distal zone are below MCLs. Implementation of MNA will include additional modeling to develop the performance monitoring approach, including final design for number and locations of monitoring wells. MNA performance reviews will be conducted every year for the first 5 years and at least every 5 years thereafter so long as performance criteria are met.

A necessary consideration in groundwater restoration by MNA is identification of a contingency remedy that can be implemented if MNA fails to meet the RAOs. Conditions that may lead to the Agencies invoking the contingency remedy include:

- An increase in levels of COCs, indicating that other source-control measures are not effective
- Significant changes in concentration ratios of TCE to PCE and TCE to tritium

- Significant differences in concentration levels of parent contaminants and/or daughter products from modeling predictions
- Significant increases in the areal or vertical extent and/or volume of the contaminant plume for parent contaminants and daughter products from that predicted by modeling estimates.
- The Agencies' determination that the required monitoring necessary for MNA has not been performed.

The contingency remedy for the distal zone is the pump-and-treat technology specified in the 1995 ROD. This contingency pump-and-treat remedy would provide groundwater extraction, aboveground treatment for VOCs, and reinjection of the treated water, or implementation of a more cost-effective remedy identified at the time a contingency remedy is needed. If, based on the reassessment, the Agencies determine that the performance of MNA will not achieve the RAOs, then the Agencies would implement the contingency pump-and-treat remedy by issuing an ESD (INEEL 1997 [INEEL/EXT-97-00931]) describing the changes to the 1995 ROD.

### 8.1.3 Institutional Controls

Institutional controls will be implemented to prevent the use of contaminated groundwater until the RAOs specified in Section 5 have been attained throughout all areas of the contaminated aquifer.

Institutional controls will consist of engineering and administrative controls to protect current and future users from health risks associated with groundwater contamination. The institutional controls will prevent ingestion of contaminated groundwater. Institutional controls for WAG 1, of which OU 1-07B is a part, are addressed in the OU 1-10 ROD (DOE-ID 1999a [DOE/ID-10682]). These controls include visible access restrictions, control of activities, prevention of well drilling (except as required to support the remedial action), and control of land use.

The approach for establishing, implementing, enforcing, and monitoring institutional controls at the INEEL, including WAG 1, has been developed in accordance with EPA's *Region 10 Final Policy on the Use of Institutional Controls at Federal Facilities* (EPA 1999b). In accordance with this policy and the OU 1-10 ROD, institutional controls for OU 1-07B are being implemented as follows:

- An institutional controls monitoring report for WAG 1 was submitted to EPA and IDEQ, as specified by the OU 1-10 ROD, within 6 months after the signature of the OU 1-10 ROD (DOE-ID 1999a [DOE/ID-10682]).
- Institutional control requirements for OU 1-07B are identified in the WAG 1 institutional control plan.
- Updated monitoring reports will be submitted to support the 5-year review process with specific submittal deadlines based on EPA and IDEQ approval.

More detailed information and requirements for WAG 1 institutional controls are included in the OU 1-10 ROD.

#### **8.1.4 Groundwater Monitoring**

Groundwater monitoring will be performed in accordance with monitoring plans developed as part of the RD/RA work plan for this ROD Amendment. Monitoring data will be used to track the contaminant plume boundary, changes in COC concentration levels, and the attenuation rate to evaluate attainment of RAOs. If periodic monitoring for COCs indicates that NPTF effluent may exceed MCLs, the frequency of monitoring at selected locations will increase to allow the Agencies to determine the appropriate response action.

A monitoring program will be designed and implemented that will:

1. At the hot spot, ensure that ISB results in complete dechlorination of TCE, quantify the dechlorination rate over time, and evaluate attainment of RAOs.
2. In the distal zone, monitor the progress of attenuation of contaminants and evaluate attainment of RAOs. If monitoring data indicate that contaminant levels are not following modeling predictions or if the required monitoring necessary for MNA is not performed, the Agencies will consider implementation of the contingency remedy or, if the Agencies concur, a more cost-effective remedy will be identified at the time that the contingency remedy is implemented.

### **8.2 Cost Estimate for the Amended Remedy**

The estimated life-cycle cost in NPV for the amended remedy is \$35 million. Table 8-1 summarizes the cost estimate for the amended remedy. Details of the cost estimate is presented in the ROD Amendment Cost Estimate Support Data Recapitulation (INEEL 2001 [EDF-ER-201]).

### **8.3 Expected Outcomes for Processes**

The Agencies' goal in this action is to restore the aquifer throughout the contaminant plume, which includes the hot spot, the medial zone, and the distal zone. The remedial action will prevent TCE and the other chlorinated VOCs above MCLs from moving from one zone to the next downgradient zone, thereby allowing each zone to be treated separately without adversely impacting either of the other zones. The amended remedy will result in attainment of the remediation goals and protection of current and future workers and future residents.

Restoration of the hot spot under the amended remedy will not directly affect radionuclides. The geochemical behavior of the radionuclides in the subsurface acts to bind them to soil and rock in the area where they are now located. This will continue to prevent them from migrating beyond the vicinity of the hot spot and from being available to future drinking water users. Estimates of radionuclide attenuation by radioactive decay indicate that Cs-137 and Sr-90 will meet RAOs throughout the contaminant plume by 2095. The remaining radionuclides (U-234 and tritium) are currently below MCLs or  $10^{-4}$  risk-based levels; concentrations of these two radionuclides are not expected to increase to levels that would prevent attainment of RAOs as a result of implementation of this amended remedy.

**Table 8-1.** Cost estimate summary for the amended remedy.

Planned Activity	Costs (in FY-99 dollars)	Net Present Value <sup>a</sup>
<b>IN SITU BIOREMEDIATION OF THE HOT SPOT</b>		
ISB Design	\$ 10,415	
ISB Construction	95,285	
ISB O&M (FY-04 to FY-18) (annual cost: \$204,891)	2,868,474	
ISB D&D (FY-31)	258,772	
<i>Total for ISB at the Hot Spot</i>	<b>3,232,940</b>	<b>\$ 1,483,576</b>
<b>MONITORED NATURAL ATTENUATION IN THE DISTAL ZONE</b>		
MNA O&M (FY-04 to FY-30) (annual cost: \$77,620)	2,095,740	
<i>Total for MNA in the Distal Zone</i>	<b>2,095,740</b>	<b>709,804</b>
<b>COMMON ELEMENTS</b>		
NPTF Construction	1,913,000	
Remedial Action Work Plan Revision	121,791	
NPTF O&M (FY-04 to FY-16) (annual cost: \$148,389)	1,929,057	
ASTU Standby Operations (FY-04 to FY-16)	65,000	
Project Management	5,745,400	
Institutional Controls	184,000	
Facility Operations/Waste Management (FY-00 to FY-03)	3,980,700	
Facility Operations/Waste Management (FY-04 to FY-30)	2,957,429	
GWTF D&D(FY-03)	1,291,087	
NPTF D&D (FY-18)	442,269	
ASTU D&D (FY-18)	1,104,820	
Groundwater Monitoring	4,490,140	
Well Abandonment (FY-31)	1,160,400	
<i>Total for Common Elements</i>	<b>25,307,490</b>	<b>14,381,518</b>
<b>COSTS INCURRED THROUGH FY-99</b>		
Treatability Studies	8,002,000	
Project Management (FY-95 to FY-99)	3,335,000	
GWTF Transition to OU 1-07B	2,466,000	
GWTF Operations (FY-95 to FY-99)	2,272,000	
Groundwater Monitoring (FY-95 to FY-99)	996,000	
NPTF Design	469,000	
NPTF Well Construction	1,300,000	
<i>Total for Costs Incurred through FY-99</i>	<b>18,840,000</b>	<b>18,840,000</b>
<b>TOTAL COSTS</b>		
TOTAL PROJECT COST	49,553,779	35,414,898
Contingency at 50% <sup>b</sup>	15,356,890	8,287,449
<b>TOTAL PROJECT COST AND CONTINGENCY</b>	<b>\$64,910,669</b>	<b>\$43,702,347</b>
a. Net present value using a 7% discount rate and assuming a 15-year operating period for both ISB at the hot spot and pump-and-treat in the medial zone, and a 30-year operating period for MNA in the distal zone.		
b. Contingency is not applied to the costs incurred through FY-99.		

## 9. STATUTORY DETERMINATIONS

Under CERCLA Section 121 and the NCP, the Agencies must select remedies that are protective of human health and the environment, that comply with ARARs (unless a statutory waiver is justified), that are cost-effective, and that utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ, as a principal element, treatment that permanently and significantly reduces the toxicity, mobility, or volume of hazardous wastes, and has a bias against off-site disposal of untreated wastes. The following sections discuss how the amended remedy meets these statutory requirements.

### 9.1 Protection of Human Health and the Environment

The amended remedy will protect human health from groundwater contaminants through the use of ISB at the hot spot; pump-and-treat in the medial zone, as chosen in the 1995 ROD); and MNA in the distal zone. Implementation of the technologies will restore the contaminant plume to drinking water quality standards by or before 2095. Removing the contaminants will prevent further degradation of groundwater within the contaminant plume.

The amended remedy will restore the contaminated aquifer groundwater by 2095 (100 years from the signature of the 1995 Record of Decision) by reducing all COCs to below MCLs and a  $1 \times 10^{-4}$  total risk-based level and, for non-carcinogens, until the cumulative hazard index is less than 1. Engineering controls and standard health and safety practices will address any short-term threats associated with the amended remedy. Any treated water that is reinjected into the aquifer will meet Idaho Administrative Procedures Act (IDAPA) 37.03.03, "Rules and Minimum Standards for the Construction and Use of Injection Wells in the State of Idaho."<sup>2</sup>

As discussed in the 1995 ROD, an ecological risk assessment showed no current exposure pathways for ecological receptors. The amended remedy, by restoring the contaminant plume to protect human health, will also protect ecological receptors. Institutional controls during the remedial action will ensure that pathways to ecological receptors will not be completed.

### 9.2 Compliance with ARARS

Implementation of the amended remedy will comply with all ARARs. However, some ARARs identified in the 1995 ROD have been deleted in this amended remedy; none have been changed. Table 9-1 lists all ARARs from the 1995 ROD and indicates which ARARs have been deleted in the amended remedy.

#### 9.2.1 ARARs Not Changed from 1995 ROD

The following ARARs apply to the amended remedy as originally cited and described in the 1995 ROD:

- IDAPA 58.01.01.585 (formerly 16.01.01.585), Toxic Air Pollutants, Non-Carcinogenic Limits

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<sup>2</sup> At the time the 1995 ROD was written, these statutes were numbered as Idaho Administrative Procedures Act (IDAPA) Title 16. At the time, the state agency was a division of the Department of Health and Welfare. In July 2001, the division became the Department of Environmental Quality, and the relevant statutes were renumbered as Title 58. Other than the difference in numbering, these statutes are unchanged.

**Table 9-1. Summary of ARARs for the amended remedy.**

Requirement (Citation)	ARAR Type			Status		Applies to Remedy Component for			Comments
	Action Specific	Chemical Specific	Location Specific	Deleted	Unchanged	Hot Spot	Medial Zone <sup>a</sup>	Distal Zone	
<b>Clean Air Act and Idaho Air Regulations</b>									
Idaho Air Pollutants noncarcinogens (IDAPA 58.01.01.585 [formerly IDAPA 16.01.01.585])		X			X		A		
Idaho Air Pollutants carcinogens (IDAPA 58.01.01.586 [formerly IDAPA 16.01.01.586])		X			X		A		
NESHAPs – <10 mrem/yr (40 CFR 61.92)		X			X		A		
NESHAPs – monitoring (40 CFR 61.93)	X				X		A		
Idaho Rules for Control of Fugitive Dust (IDAPA 58.01.01.650 and .651 [formerly IDAPA 16.01.01.650 and .651])	X				X		A		
<b>RCRA and Hazardous Waste Management Act</b>									
<b>Generator Standards</b>									
IDAPA 58.01.05.006 (formerly IDAPA 16.01.05.006)	X				X				
Hazardous Waste Determination (40 CFR 262.11)	X				X	A	A	A	Not required for secondary waste streams in the medial and distal zones, for which applicable NLCI determinations have been made.
<b>General Facility Standards</b>									
IDAPA 58.01.05.008 (formerly IDAPA 16.01.05.008)	X		X		X				
General Waste Analysis (40 CFR 264.13)	X				X	A	A	A	
Location Standards (40 CFR 264.18 (a) and (b))			X		X		A		
Preparedness and Prevention (40 CFR Subpart C, 264.31–37)	X				X	A	A	A	
Closure Performance Standard (40 CFR 264.111)	X				X	A	A		
Disposal/Decontamination (40 CFR 264.114)	X				X	A	A		
Use/Management of Containers (40 CFR 264, Subpart I)	X				X	A	A	A	
Tank Systems (40 CFR 264, Subpart J)	X				X		A		
Miscellaneous Units (40 CFR 264, Subpart X)	X			X					Deleted; no specific requirements are applicable to the treatment systems.
Air Emission Standards for Process Vents (40 CFR 264, Subpart AA)	X			X					Deleted; the VOC concentrations in water to be treated in medial zone P&T operations are < 10 ppmw.
<b>Land Disposal Restrictions (IDAPA 58.01.05.011 [formerly IDAPA 16.01.05.011])</b>									
	X				X	A	A	A	
<b>RCRA, Section 3020</b>									
	X	X			X	A	A	A	
<b>Underground Injection Control</b>									
Idaho Rules for the Construction and Use of Injection Wells (IDAPA 37.03.03)	X	X			X	A	A	A	
<b>Idaho Public Drinking Water</b>									
MCLs (numerical standards only) (IDAPA 58.01.08.050.02 and .05 [formerly IDAPA 16.01.08.050.02 and .05])		X			X	R	R	R	
Secondary MCLs (numerical standards only) (IDAPA 58.01.08.400.03 [formerly IDAPA 16.01.08.400.03])		X			X				
<b>National Historic Preservation Act</b>									
Scope of Identification (36 CFR 800.4(a)(1)(i), (iii)(a)(2))			X		X			A	
Identify Historic Properties (36 CFR 800.4(b))			X		X			A	
<b>To-Be-Considered</b>									
Radiation Protection of the Public and the Environment (DOE Order 5400.55)	X				X	A	A		Worker protection standard applies to workers only
Fire Protection (DOE Order 5480.7A)	X			X					Canceled; superseded by DOE Order 420.1
Radioactive Waste Management (DOE Order 5820.2A)	X			X					Canceled by DOE Order 435.1

Key: A = applicable requirement; NLCI = no longer contained in; P&T = pump and treat; R = relevant and appropriate requirement  
a. ARARs that apply to the medial zone apply to the contingency remedies for the medial zone and the distal zone.

Key: A = applicable requirement; NLCI = no longer contained in; P&T = pump and treat; R = relevant and appropriate requirement

a. ARARs that apply to the medial zone apply to the contingency remedies for the medial zone and the distal zone.



- IDAPA 58.01.01.586 (formerly 16.01.01.586), Toxic Air Pollutants, Carcinogenic Increments, and the following, as cited in it:
  - 40 Code of Federal Regulations (CFR) 61.92, National Emission Standards for Hazardous Air Pollutants (NESHAPS) Standard
- 40 CFR 61.93, NESHAPs Emission Monitoring and Test Procedures
- IDAPA 58.01.01.650 and .651 (formerly 16.01.01.650 and .651), Rules for Control of Fugitive Dust
- IDAPA 58.01.05.006 (formerly 16.01.05.006), Standards Applicable to Generators of Hazardous Waste, and the following, as cited in it:
  - 40 CFR 262.11, Hazardous Waste Determination
- IDAPA 58.01.05.008 (formerly 16.01.05.008), Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities, and the following, as cited in it:
  - 40 CFR 264.13, General Waste Analysis
  - 40 CFR 264.18 (a) and (b), Location Standards: Seismic Considerations, and Floodplains
  - 40 CFR 264, Subpart C (Sections 31–37), Preparedness and Prevention
  - 40 CFR 264.111, Closure Performance Standard
  - 40 CFR 264.114, Disposal or Decontamination of Equipment, Structures, and Soils
  - 40 CFR 264, Subpart I, Use and Management of Containers
  - 40 CFR 264, Subpart J, Tank Systems
- IDAPA 58.01.05.011 (formerly 16.01.05.011), Land Disposal Restrictions
- RCRA, Section 3020
- IDAPA 37.03.03, Rules and Minimum Standards for the Construction and Use of Injection Wells in the State of Idaho
- IDAPA 58.01.08.050.02 and 050.05 (formerly 16.01.08.050.02 and 050.05), Maximum Contaminant Levels and Maximum Residual Disinfectant Levels
- IDAPA 58.01.08.400.03 (formerly 16.01.08.400.03), Secondary MCLs
- 36 CFR 800.4(a)(1)(i), 800.4(a)(1)(iii), and 800.4(a)(2), Identification of Historic Properties: Scope of Identification Efforts

- 36 CFR 800.4(b), Identification of Historic Properties: Identify Historic Properties
- DOE Order 5400.5, Radiation Protection of the Public and the Environment

### 9.2.2 ARARs that No Longer Apply

The following ARARs cited in the 1995 ROD have been deleted, because they no longer apply:

- 40 CFR 264, Subpart X, Miscellaneous Units
- 40 CFR 264, Subpart AA, Air Emission Standards for Process Vents
- DOE Order 5480.7A, *Fire Protection*. DOE Order 5480.7A was canceled by DOE. It has been superseded by DOE 420.1, *Facility Safety*. Appropriate measures will be taken for worker safety
- DOE Order 5820.2A, *Radioactive Waste Management*. DOE Order 5820.2A was canceled by DOE Order 435.1, *Radioactive Waste Management*, on July 9, 1999

### 9.2.3 Clarification of ARARs

The Agencies have agreed to clarify ARARs that apply at the hot spot (ISB Component) as follows:

- In accordance with IDAPA 37.03.03.050.01, which deals with construction and use of injection wells, the Agencies have agreed that, to support ISB, amendments containing constituents above MCLs may be injected so long as injected fluid will not endanger a drinking water or groundwater source for any present or future beneficial use.

The Agencies have agreed to clarify ARARs that apply to the medial zone (NPTF component) as follows:

- 40 CFR 264, Subpart AA, Air Emission Standards for Process Vents, applies to treatment of water with organic concentrations of at least 10 parts per million weight (ppmw). The concentration of VOCs in water to be treated in the medial zone pump-and-treat operations is below 10 ppmw. Therefore, this is not an ARAR for the amended remedy.
- The Agencies do not intend to reinject radionuclides above MCLs.
- The TCE in the contaminated groundwater is a listed waste. Therefore, all components on the influent side of the treatment system, including the air stripper equipment, have been designed to meet the secondary containment requirements of 40 CFR 264, Subpart J, of RCRA. After the air stripping process, the concentration of hazardous constituents in groundwater will be less than the applicable MCL and will result in a cumulative carcinogenic risk of less than  $1 \times 10^{-5}$ . As a result, a no-longer-contained-in determination is applicable and the NPTF effluent is not a listed hazardous waste.

The Agencies have agreed to clarify ARARs that apply to the distal zone (MNA component) as follows:

- IDAPA 37.03.03, Rules and Minimum Standards for the Construction and Use of Injection Wells in the State of Idaho, applies to the reinjected water because the NPTF reinjection well is located in the distal zone.

The Agencies have agreed to clarify ARARs that apply to the contingency remedies for the medial and distal zones as follows:

- ARARs that apply to the remedy component for the Medial Zone apply to the contingency remedies for the medial zone and the distal zone.

### **9.3 Cost-Effectiveness**

In the Agencies' judgment, the amended remedy is cost-effective and represents a reasonable value for the money to be spent. In making this determination, the Agencies used the following definition from NCP Section 300.430(f)(1)(ii)(D): "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." The Agencies' determination was accomplished by evaluating the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and compliant with ARARs). Overall effectiveness is evaluated by assessing three of the five balancing criteria in combination: long-term effectiveness and permanence; reduction in toxicity, mobility, or volume through treatment; and short-term effectiveness, and then comparing the overall effectiveness to costs to determine cost-effectiveness. The relationship of the overall effectiveness of the amended remedy was determined to be proportional to its costs and, hence, it represents a reasonable value for the money to be spent.

The estimated life-cycle cost in NPV for the amended remedy is \$35 million. (That figure includes costs expended through Fiscal Year 1999 but does not include a contingency.)

### **9.4 Utilization of Permanent Solutions and Alternative Treatment or Resource Recovery Technologies to the Maximum Extent Practicable**

The Agencies have determined that the amended remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner for the final remedial action at this site. The Agencies determined that the amended remedy provides the best balance of trade-offs in terms of the five balancing criteria (described in Section 7), while also considering the statutory preference for treatment as a principal element and bias against off-site treatment and disposal, and considering state and community acceptance.

The amended remedy for OU 1-07B is intended to help prevent further degradation of the groundwater by containing and treating the source through the alternative and innovative treatment technology of ISB, which will permanently destroy the VOCs in situ through anaerobic reductive dechlorination, and performing MNA for the dissolved phase contaminant plume.

## **9.5 Preference for Treatment as a Principal Element**

The statutory preference for remedies that employ treatment as a principal element is satisfied because treatment is utilized for two of the three zones of the plume (the hot spot and the medial zone), which have the highest concentrations of VOCs.

## **9.6 Five-Year Review Requirements**

Because this remedy will result in COCs remaining on-site during the remedial action above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within 5 years after initiation of remedial action, and at least every 5 years thereafter through the standard CERCLA 5-year review process. The reviews will be conducted to ensure that the amended remedy is, or will be, protective of human health and the environment. This provision does not preclude more frequent reviews by one or more of the Agencies.

## **10. DOCUMENTATION OF SIGNIFICANT CHANGES**

No substantive changes were made from the Proposed Plan, although minor language clarifications were made.

## 11. REFERENCES

- 36 CFR 800.4, 2000, "Identification of Historic Properties," *Code of Federal Regulations*, U.S. Government Printing Office, July.
- 40 CFR 61, 2000, National Emission Standards for Hazardous Air Pollutants, *Code of Federal Regulations*, U.S. Government Printing Office, April.
- 40 CFR 262, 2000, "Standards Applicable to Generators of Hazardous Waste," *Code of Federal Regulations*, U.S. Government Printing Office, July.
- 40 CFR 264, 2000, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," *Code of Federal Regulations*, U.S. Government Printing Office, July.
- 40 CFR 300, 2000, "National Oil and Hazardous Substances Pollution Contingency Plan," *Code of Federal Regulations*, U.S. Government Printing Office, July.
- DOE Order 5400.5, 1993, "Radiation Protection of the Public and the Environment," U.S. Department of Energy, January.
- Executive Order 12580, 1987, "Protection of Environment, Superfund Implementation," U.S. Government Printing Office, January.
- IDAPA 37.03.03, 2000, "Rules and Minimum Standards for the Construction and Use of Injection Wells in the State of Idaho," *Idaho Administrative Code*, Department of Water Resources, July.
- IDAPA 58.01.01, 2000, "Rules for the Control of Air Pollution in Idaho," *Idaho Administrative Code*, Idaho Department of Administration, July.
- IDAPA 58.01.05, 2000, "Rules and Standards for Hazardous Waste," *Idaho Administrative Code*, Idaho Department of Administration, July.
- IDAPA 58.01.08, 2000, "Idaho Rules for Public Drinking Water Systems," *Idaho Administrative Code*, Idaho Department of Administration, July.
- 42 USC 82 §§ 6901 et seq., "Resource Conservation and Recovery Act," *U.S. Code*, U.S. Government Printing Office.
- 42 USC 103 §§ 9601 et seq., "Comprehensive Environmental Response, Compensation, and Liability Act," *U.S. Code*.
- DOE-ID, 1995, *Record of Decision for the Technical Support Facility Injection Well (TSF-05) and Surrounding Groundwater Contamination (TSF-23) and Miscellaneous No Action Sites Final Remedial Action*, DOE/ID-10139, August.
- DOE-ID, 1997a, *Remedial Design/Remedial Action Scope of Work, Test Area North Final Groundwater Remediation, Operable Unit 1-07B*, DOE/ID-10522, August.
- DOE-ID, 1997b, *Technology Evaluation Work Plan, Test Area North Final Groundwater Remediation, OU 1-07B*, DOE/ID-10562, March.

- DOE-ID, 1998a, *Natural Attenuation Field Evaluation Work Plan, Test Area North, Operable Unit 1-07B*, DOE/ID-10606, February.
- DOE-ID, 1998b, *In Situ Bioremediation Field Evaluation Work Plan, Test Area North, Operable Unit 1-07B*, DOE/ID-10639, September.
- DOE-ID, 1999a, *Final Record of Decision for Test Area North, Operable Unit 1-10*, DOE/ID-10682, October.
- DOE-ID, 1999b, *Phase C Remedial Action Work Plan for Test Area North Final Groundwater Remediation, Operable Unit 1-07B*, DOE/ID-10679, October.
- DOE-ID, 1999c, *In Situ Chemical Oxidation Field Evaluation Work Plan for the TSF-05 Hot Spot, Test Area North Final Groundwater Remediation, Operable Unit 1-07B*, DOE/ID-10698, November.
- DOE-ID, 2000a, *Field Demonstration Report, Test Area North Final Groundwater Remediation, Operable Unit 1-07B*, DOE/ID-10718, March.
- DOE-ID, 2000b, *New Pump and Treat Facility Remedial Design, Test Area North, Operable Unit 1-07B*, DOE/ID-10661, March.
- DOE-ID, EPA, and IDEQ 2000, *Proposed Plan for Operable Unit 1-07B, Final Remedial Action at the TSF Injection Well (TSF-05) and Surrounding Groundwater Contamination (TSF-23)* (DOE/ID-21251), November.
- EG&G, 1994, *Remedial Investigation (RI) Final Report with Addenda for the Test Area North (TAN) Groundwater (GW) Operable Unit (OU) 1-07B at the INEL, Volumes 1 and 2*, EGG-ER-10643, Vol. 1 and 2, January.
- EPA, 1999a, *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites*, EPA 540-F-99-009, OSWER Directive 9200.4-17P, April.
- EPA, 1999b, *Region 10 Final Policy on the Use of Institutional Controls at Federal Facilities*, EPA Region 10, Office of Environmental Cleanup, May.
- EPA, 1999c, *Guidance on Preparing Superfund Decision Documents*, EPA 540-R-98-031, OSWER Directive 9200.1-23P, July.
- INEL, 1992, *Record of Decision (ROD) for Technical Support Facility (TSF) Injection Well and Surrounding Groundwater Contamination*, INEL-5202, September.
- INEL, 1998, *Well Characterization and Evaluation Report Supporting Functional and Operational Requirements for the New Pump and Treat Facility at Test Area North Operable Unit 1-07B*, INEL/EXT-97-01356, January.
- INEL, 2000, *Microbial Studies Report Supporting Implementation of In Situ Bioremediation at Test Area North*, INEL/EXT-98-00474, November.
- INEEL, 1997, *Explanation of Significant Differences from the Record of Decision for the Technical Support Facility Injection Well (TSF-05) and Surrounding Groundwater Contamination (TSF-23) and Miscellaneous No Action Sites, Final Remedial Action*, INEEL/EXT-97-00931, November.

- INEEL, 1998, *Site Conceptual Model: 1996 Activities, Data Analysis, and Interpretation – Test Area North Operable Unit 1-07B*, INEL/EXT-97-00556, February.
- INEEL, 1999a, *Numerical Modeling Support of the Natural Attenuation Field Evaluation for Trichloroethene at the Test Area North, Operable Unit 1-07B*, INEL/EXT-97-01284, January.
- INEEL, 1999b, *Phase C Groundwater Monitoring Plan*, INEL/EXT-99-00021, October.
- INEEL, 2000a, *Fiscal Year 1999 Groundwater Monitoring Report, Test Area North, Operable Unit 1-07B*, INEL/EXT-99-01255, January.
- INEEL, 2000b, *Aerobic Biodegradation Laboratory Studies at Test Area North, Operable Unit 1-07B*, INEL/EXT-99-00736, April.
- INEEL, 2000c, *Engineering Design File (EDF) – Metals Analysis of Selected OU 1-07B Groundwater Monitoring Wells*, INEL/EXT-2000-00821 (EDF-ER-200), Rev. 0, October.
- INEEL, 2000d, *Sampling and Analysis Plan for the Enhanced In Situ Bioremediation Field Evaluation, Test Area North, Operable Unit 1-07B*, Rev. 2, INEL/EXT-98-00421, October.
- INEEL, 2001, *Engineering Design File (EDF) – WAG 1, OU 1-07B, Record of Decision (ROD) Amendment Cost Estimate Support Data Recapitulation*, EDF-ER-201, Rev. 2, August.
- ORNL, 1999, *Laboratory Evaluation of In Situ Chemical Oxidation for Groundwater Remediation, Test Area North, Operable Unit 1-07B, Idaho National Engineering and Environmental Laboratory*, ORNL/TM-13711, April.